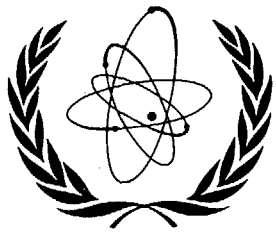

International Atomic Energy Agency

ANNUAL REPORT TO THE ECONOMIC AND SOCIAL COUNCIL OF THE UNITED NATIONS FOR 1966-67

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INFCIRC/93

Printed by the
International Atomic Energy Agency
in Austria - May 1967

THE AGENCY'S ANNUAL REPORT TO THE ECONOMIC AND SOCIAL COUNCIL OF THE UNITED NATIONS FOR 1966-67

The text of the Agency's annual report to the Economic and Social Council of the United Nations for 1966-67 is reproduced in this document for the information of all Members.

ANNUAL REPORT BY THE INTERNATIONAL ATOMIC ENERGY AGENCY TO THE ECONOMIC AND SOCIAL COUNCIL FOR 1966-67

(For the period 1 April 1966 - 31 March 1967)

C O N T E N T S

List of abbreviations

ACC	Administrative Committee on Co-ordination
Agency	International Atomic Energy Agency
Board of Governors	of the International Atomic Energy Agency
Council	Economic and Social Council of the United Nations
ECAFE	Economic Commission for Asia and the Far East
ECOSOC	Economic and Social Council of the United Nations
ENEA	European Nuclear Energy Agency of the Organisation for Economic Co-operation and Development
EPTA	United Nations Expanded Programme of Technical Assistance
FAO	Food and Agriculture Organization of the United Nations
General Conference	of the International Atomic Energy Agency
IAEA	International Atomic Energy Agency
IANEC	Inter-American Nuclear Energy Commission of the Organization of American States
IHD	International Hydrological Decade
ILO	International Labour Office (Organisation)
IMCO	Inter-Governmental Maritime Consultative Organization
OECD	Organisation for Economic Co-operation and Development
TA	Technical Assistance
UNDP	United Nations Development Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization
WHO	World Health Organization
WMO	World Meteorological Organization

NOTE

All sums of money are expressed in United States dollars.

INTRODUCTION

1. The annual report to the United Nations on all the Agency's activities is submitted to the General Assembly pursuant to Article III. B. 4 of the Statute. The present report, which covers the period 1 April 1966 to 31 March 1967, is therefore confined to those aspects of the Agency's work which are directly related to economic and social development.

2. It has been written as an analytical summary, and the format is based on the request for a substantially uniform pattern made by ECOSOC in Resolution 1172 (XLI) and in line with ACC's subsequent decision that "the topics suggested in the Council's Co-ordination Committee should be used, insofar as relevant and in a flexible way, as the framework for the analytical reports". The sub-titles in the present report are accordingly drawn from among those topics.

I. ACTIVITIES OF MAJOR ORGANS

3. The tenth regular session of the General Conference was held in Vienna from 21 to 28 September 1966. This provided an opportunity for taking stock of the Agency's accomplishments since its Statute was approved at United Nations Headquarters in October 1956. It was generally felt that the Agency had developed sound programmes, and was satisfactorily discharging most of its statutory functions. One of the main themes which emerged from the debates was that the Agency might now be in a position to do more to help the developing countries.

4. This is reflected in two of the resolutions adopted. In the first [1] the Director General was invited to continue to use all practicable means to further the progress of training, and was requested to consult with the Directors-General of ILO and UNESCO with a view to intensifying co-operation and co-ordination.

5. In the second resolution [2] the General Conference requested the Board of Governors, in consultation with the Director General, to review the activities of the Agency. The main purpose of such a review would be to find ways and means to increase its assistance to developing countries.

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[1] GC(X)/RES/215.

[2] GC(X)/RES/217.

II. ADMINISTRATIVE AND BUDGETARY QUESTIONS

6. In 1966 the Agency's Regular Budget amounted to $8 744 000, of which $8 426 500 represented assessed contributions from Member States; in addition, a supplementary appropriation of a sum not exceeding $275 000 was approved to meet such part of increased staff emoluments as could not be covered from other budgetary savings. The Regular Budget for 1967 has been set at $9 491 500, of which $9 174 000 represents assessed contributions.

7. The Agency's Operational Budget amounted to $2 478 000 in 1966 and has been set at $2 408 000 for 1967. Of these amounts $2 million represents the target set for voluntary contributions from Member States for each year; the balance in each case is to be obtained from special contributions for specific purposes and from minor miscellaneous income. By 31 March 1967 pledges of voluntary contributions for 1966 amounted to 64.31% and for 1967 to 67.99% of the targets.

8. The recommendations contained in the second report of the Ad hoc Committee of Experts to Examine the Finances of the United Nations and the Specialized Agencies [3] were brought to the attention of the Board at its meetings in February, together with an analysis by the Director General of those recommendations which would affect the Agency. After a preliminary discussion it was decided to refer the question to the Administrative and Budgetary Committee of the Board for detailed study on the basis of which the Board will take it up again at its meetings in June.

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[3] United Nations document A/6343.

III. CO-ORDINATION AND RELATIONS WITH OTHER BODIES OF THE UNITED NATIONS FAMILY OF ORGANIZATIONS

9. There are many instances where nuclear science or technology impinges upon other disciplines or techniques, e.g. the applications of nuclear science in hydrology, the use of nuclear power to propel ships, the many applications of nuclear techniques in industry, and, indeed, the use of nuclear energy to produce electricity, which is the main practical application of atomic energy. Hence there is a continuing need for bilateral contact and co-ordination with the United Nations Department of Economic and Social Affairs (which is concerned with conventional means of power generation), with the various agencies interested in hydrology, with IMCO, and with the newly established United Nations Industrial Development Organization.

10. In such cases, relationship agreements, direct contacts between secretariats and multilateral consultation in various ACC sub-committees have proved to be an adequate means of ensuring technical co-operation and preventing serious duplication. In the cases of food and agriculture, and of medicine and health, however, the widespread and growing use of nuclear science, as well as the health problems to which nuclear technology gives rise, have made it necessary to set up special arrangements between the Agency on one side and FAO and WHO on the other.

11. As far as WHO is concerned, the exchange of technical liaison officers has proved a useful arrangement to effect day-to-day consultation and co-ordination. A further step was taken in November 1966 when a meeting was held in Vienna between the Assistant Directors-General of WHO concerned and the Agency's Deputy Directors General, to study ways of improving co-ordination. General guidelines were agreed on, defining programme areas of mutual interest, and laying down practical arrangements for programme implementation that would lead to the best use of available resources.

12. It will be recalled that the Joint FAO/IAEA Division of Atomic Energy in Agriculture was established in Vienna on a trial basis with effect from 1 October 1964. The experience gained was reviewed and, in November 1966, arrangements came into force providing for the continuance of the Joint Division, to be known thereafter as the "Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture". The aim of the Joint Division will continue to be to ensure that the technical services of both organizations are brought together to develop a single joint programme for atomic energy in food and agriculture on behalf of both organizations.

13. The Agency has continued to participate actively in the work of the United Nations Advisory Committee on the Application of Science and Technology to Development, especially in drawing up the World Plan of Action and assisting in the studies to improve the supply of edible protein. The Agency is considering the recommendations made by the Committee in its Third Report [4] in relation to its own programme.

14. The Agency also works with certain organizations outside the United Nations family having, for example, co-operation agreements with ENEA and IANEC. In view of the considerable overlap of objectives, co-operation and consultation is necessarily close and frequent.

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[4] United Nations document E/4178.

IV. DEVELOPMENTS IN MAJOR PROGRAMMES

15. The Agency's programmes may play a part in helping to solve two of the main problems of the developing countries: the widening gap between food supplies and the expanding population, and the need to introduce modern industry to raise standards of living and diversify the economic structure. The Agency's major programmes in this respect are:

(a) Fostering the use of nuclear power. Plentiful and cheap energy and power are necessary for industrial growth. It is estimated that the Agency spent approximately $673 000 on power (including desalination) in 1966 [5];

(b) The use of nuclear techniques to increase, improve and protect food. This programme accounted for approximately $927 000 in 1966 [6]; and

(c) The use of nuclear techniques in the development of water resources. The expenditure in 1966 was approximately $203 200.

(a) Fostering the use of nuclear power

Recent world developments

16. Nuclear power has made much progress during the past year. An unexpectedly large number of new orders has been placed for nuclear stations. While the estimated operating costs of nuclear power stations have been competitive for several years, 1966 was the first year in which the estimated unit capital cost of a nuclear plant dropped (in the case of a very large station) below that of a conventional coal-fired station.

17. During 1966 new orders in all countries totalled 23 000 MW(e) as compared to 8500 MW(e) nuclear capacity in operation at the end of the year. In the United States of America about 19 000 MW(e) of nuclear capacity was ordered - considerably more than half of the total additional capacity of all kinds of plants ordered during the year. A striking example of the competitiveness of nuclear power was afforded by the decision to build a 2 by 1100-MW(e) nuclear station in one of the lowest fuel cost areas of the world where delivered coal prices are about $4.5 per ton (19 cents per million BTU's). Later in the year, the United Kingdom Central Electricity Generating Board announced their intention of placing an order for a 2 by 600-MW nuclear station, Hinkley Point B. This will be of the same type as the Dungeness B station ordered in 1965, for which a saving of 10% in production costs was predicted as compared with a coal-fired station. At the end of 1966 an announcement was made concerning the construction of the Bilibin atomic power station in the Polar region in the Union of Soviet Socialist Republics.

18. Several power reactors went critical in North America and Western Europe; and Bulgaria and Hungary have announced their intention of purchasing two nuclear units rated at 400 MW(e) each. A decision was also taken to build two more nuclear power stations in Japan, raising to over 1000 MW(e) the amount of nuclear capacity under construction. India is due to complete its first nuclear power plant in 1967 and has two more on order, while Pakistan has begun construction of a 137-MW(e) heavy-water power reactor. Several developing countries are intensifying their studies on their own nuclear projects.

19. The known world resources of uranium, which has been a surplus commodity during the past decade, may become insufficient as a result of expanding nuclear power programmes, and the time is coming for a renewed effort to be made to find new supplies which are likely to exist in many parts of the world. Interest is also growing in thorium as a nuclear raw material.

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[5] In view of the inter-relation between nuclear power and desalination projects, it is not possible to separate costs.

[6] This does not include $348 650 for the Turkey grain irradiation project.

20. It is not surprising therefore that several advanced countries continue to devote large and increasing resources to fast-breeder reactors. These will require a small fraction of the uranium needed by the present generation of plants per kWh of power produced. They are expected to come on line in the late 1970's or early 1980's. The United Kingdom and the Soviet Union are constructing prototypes, and France has announced that it will also begin construction in 1969.

Agency activities (including work in co-operation with other organizations)

21. The programme of the Agency includes activities relating to the three main subjects referred to above, i.e. present power reactor systems, problems of fuel supply, and development of new reactor systems.

22. In September 1966 at an international survey course on economic and technical aspects of nuclear power (attended by 55 senior engineers and scientists from 30 countries) the latest developments in the technology, cost and economics of nuclear power were reviewed and the best means of evaluating the possible role of nuclear power in a given country were discussed.

23. A study group meeting on problems and prospects of nuclear power applications in developing countries was held in Manila in October. It was attended by 45 participants from nine countries in the ECAFE region. The improving prospects for nuclear power in the region were noted but it was thought that the problems of finance and of the training of technical manpower may slow down its early introduction.

24. In the year under review, panels of experts were convened to consider specific problems such as the safe operation of nuclear power plants and the inspection of reactor vessels during their operating lifetime.

25. The Agency completed the UNDP Pre-investment Study on Power, Including Nuclear Power, in Luzon, the Philippines, having subcontracted to the United Nations the investigations relating to conventional resources. The final report was submitted in September 1966. The study concludes that the country lacks indigenous resources to meet the projected requirements of the Luzon Grid and will have to rely upon imported fuels, nuclear or conventional. A 300-MW nuclear reactor at a fixed annual charge of about 16% would be competitive with an oil-fired station even if the cost of oil, exclusive of import duties and taxes, dropped to $13.4 per ton from the present price of $15.2 per ton. The study recommends a nuclear programme of 1000 MW, comprising three units of 300, 300 and 400 MW, to be brought into operation at intervals of a year, beginning in late 1971. The initial plant investment for the nuclear programme would be $182 million as opposed to $147 million for the conventional alternative of four oil-fired plants of 250 MW each. However, the lower fuelling expenses for nuclear stations would help recover the higher initial investment by 1979, after which the relative annual saving would be about $14 million. The study urges the Government to train more technical manpower and enact appropriate atomic legislation to pave the way for using nuclear power. These recommendations are being considered by the Government which has agreed to release the study for the information of other countries which may be considering making nuclear power feasibility studies.

26. Missions were sent to Chile, China and Peru to advise on the prospects of using nuclear power, or in some cases in conjunction with desalination on the selection of appropriate sites for nuclear plants.

27. The Agency and ENEA have arranged for a regular review to be made of world uranium and thorium resources. New techniques to process low-grade ores economically could augment available resources. A panel of specialists which met in July 1966 discussed methods for processing low-grade uranium ores and reviewed the significant improvements made during the last few years.

28. The use of thorium, an abundant fertile nuclear material, could play an important role in reducing nuclear power costs. The Agency has arranged for a working group from countries interested in thorium-fuelled reactors and from developing countries that have large reserves of thorium ore to meet from time to time to review advances in thorium-fuelled reactor technology and exchange information. The first meeting was held in December 1966.

29. Plutonium is an important by-product from existing reactors since it can be used as fissile material in power reactors - particularly fast breeders. An international symposium on this subject was organized in March 1967 in co-operation with the Government of Belgium.

30. Liquid sodium is a promising coolant for fast-breeder reactors in which the heat production is very concentrated. Developments in the technology of liquid alkali metals, particularly in relation to sodium, were reviewed in a symposium held in November 1966.

(b) Use of nuclear techniques to increase, improve and protect food

Recent world developments

31. Not only is the amount of food grown insufficient to meet the world's expanding population, but much of what is produced is lost in transit from the field to the consumer through deterioration or through the inroads of insect and other pests.

32. The Agency, in the past, has reported to both ECOSOC and the Advisory Committee on Science and Technology on the use of radiation to protect food and to control or eliminate insect pests. Nuclear techniques which can help to increase the production of food are being used in studies of plant genetics, in breeding new varieties of plants, in studies of the fertility and structure of the soil, of the way in which plants are nourished by the soil, as well as in practical applications to measure soil moisture and to help in irrigation works. In general terms, the agricultural applications of radioisotopes and radiation are moving from the laboratory to the field and factory and are beginning to be transferred from technically advanced to developing countries.

The joint work of the Agency and FAO

33. ECOSOC was informed last year of some of the work being done by the Joint FAO/IAEA Division of Atomic Energy in Food and Agriculture with regard to the application of the nuclear techniques referred to above. These joint FAO/IAEA activities have continued in the year under review, and additional developments in those which are thought to be of most direct interest to the developing countries are reported upon below.

1. Food preservation and processing

(i) Food disinfestation

34. Last year it was reported that a project had been approved by the Governing Council of the Special Fund for the installation and commissioning of a pilot plant for radiation disinfestation of grains in Antalya, Turkey.[7] This is expected to be in operation in the spring of 1967. Capable of handling 30 tons of grain per hour, it will be the first facility at which comparative technical and economic evaluations can be carried out, and will illustrate the industrial potential of this technique for other developing countries.

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[7] Agency document INFCIRC/80 - (United Nations document E/4183) - para. 9.

(ii) Food radicidation [8]

35. The infection of food by microorganisms harmful to human health (e. g. Salmonella) is a serious problem in some countries. Research is being undertaken on this subject as a result of contracts awarded by the Agency to institutes in different countries.

(iii) Food radurization [9] and radappertization [10]

36. Attention is being focussed on increasing the shelf-life of fish and fruits. This can be doubled or even trebled by irradiation treatment used in conjunction with refrigeration.

37. Discussions are being held with various Member States on the possibility of installing pilot irradiation plants for demonstration purposes; research contracts are also being awarded in this connection.

38. The Agency's Laboratory is studying tissue changes that take place in vegetables irradiated to prolong their storage life. This work is co-ordinated with a broader programme on irradiation of fruit and fruit juices in which the Agency is collaborating with ENEA and the Austrian Atomic Energy Research Organization.

39. The Agency and FAO are also jointly studying the special problems that arise in connection with the use of radiation to preserve fruit and vegetables in the tropics.

40. Another joint programme is on the use of isotopes and radiation in advancing dairy science and technology. A seminar was held on this subject in July 1966.

41. An international symposium on food irradiation, which was held at Karlsruhe, Federal Republic of Germany in June 1966, showed that, after much further research, irradiation of food will play an important role in the life of mankind. This will be beside, and in many instances in conjunction with, the conventional food treatment methods such as heat, refrigeration and chemicals.

2. Control or elimination of insect pests

42. The Agency's programme has consisted chiefly of developing and promoting the application of the sterile-male technique, which has been described in previous reports [11]. One of the main problems is to find a cheap way of rearing large numbers of the insect to be controlled. Co-operation with the Citrus Marketing Board of Israel has resulted in the development of an inexpensive diet for rearing the Mediterranean fruit fly. The Agency's Laboratory has developed techniques for producing several million flies a week.

43. This work is being turned to good use in the UNDP/Special Fund project for the eradication of the Mediterranean fruit fly in Central America. A facility has been built where the fly is being produced in large numbers and major releases of sterile flies are taking place.

44. The difficulty of rearing the olive fly in large numbers has been previously reported. More encouraging results have been obtained recently, however, and the problem is being actively pursued.

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[8] Elimination of harmful organisms in food and feed by irradiation.

[9] Prolonging the shelf-life of foodstuffs by means of irradiation.

[10] Radiosterilization of foodstuffs.

[11] See particularly the Agency's Report to ECOSOC for 1964-65: Agency document INFCIRC/61 - (United Nations document E/4022) - Annex I, paras. 48-51.

3. Plant breeding and genetics

45. The technique of artificially inducing mutations is now being accepted by plant breeders. Although great variability is a natural feature of crop plants, certain desired traits, such as straw strength, the shortening of the growing season, and resistance to some diseases, may have to be induced artificially.

46. Seven countries are now participating in the Co-ordinated Rice Mutation Programme. Several promising mutant strains of rice have already been produced in China, India and Japan, some of which mature as much as 50 days earlier than the standard variety, while others have improved grain quality, higher yield and increased resistance to disease. Excellent results were obtained when high-yielding and strong-stemmed mutant strains of wheat were tested in uniform experiments in nine countries of the Near and Middle East region.

47. The Agency's Laboratory has begun work, in collaboration with the FAO Near-East Wheat and Barley Project, on radiation-induced resistance to major wheat diseases.

(c) Use of nuclear techniques in the development of water resources

1. Use of nuclear techniques to develop underground and surface water resources

Recent world developments

48. The principles involved in using isotopes in hydrological and water resources studies are much the same as those involved in using them to trace or measure any other fluids, such as blood in the human body. The isotope (or "isotopically labelled" substance) is introduced in minute quantities into the water about which information is required. The isotopes may be various radioactive chemicals introduced artificially for tracing, or may occur naturally in rain and snow. These latter so-called environmental isotopes include the radioactive isotope of hydrogen - tritium - considerable amounts of which were injected into the atmosphere during thermonuclear testing, and the heavy non-radioactive isotopes of oxygen and hydrogen, which are found in varying amounts in all water in nature. Apart from their radioactivity or slight difference in mass, these isotopes differ little from their normal companion atoms in the water molecule. Thus, these isotopes travel with the ordinary atoms in water, or differ in a predictable way, which can be detected and measured.

49. These characteristics have led to the increasing use of isotope techniques in a large range of studies, for instance to investigate:

(i) The amount of water flowing down a river;

(ii) The age of snow in glaciers;

(iii) The direction and flow of underground water;

(iv) The seepage of water through the soil;

(v) The seepage of water from reservoirs and canals;

(vi) How long it takes to recharge a given body of water and therefore how much can be safely used each year; and

(vii) Identifying the relationship between different bodies of water and the areas of recharge of a particular river system.

50. Isotope techniques are also being used increasingly to measure the movement of sediment in rivers and streams, which must be known when building barrages and dams.

51. As in medicine and agriculture, so too in hydrology, radioisotope techniques are thus becoming a necessary part of the armoury of the investigator. For the present, the most widespread practical applications are in studying the movement of sediment and the movement of groundwater and in determining the relationship between groundwater and surface water.

Agency activities (including work in co-operation with other organizations)

52. The Agency has a broad programme for applying nuclear techniques in hydrology which involves co-operation with the United Nations, FAO, UNESCO, WHO and WMO. The programme comprises symposia, working groups, panels, publications, training courses, research contracts and special missions.

53. The practical work which the Agency does as a sub-contractor in studies of water resources carried out by other members of the United Nations family may be of particular interest to the Council. In this way, one of the most sophisticated and modern techniques is brought to bear upon the problems of some of the most arid and poor regions of the world. This represents sometimes the first contact between a developing country and applied nuclear science.

54. In the year under review, missions were sent to Argentina, Brazil, Cyprus, Hungary, Peru, Romania, Tunisia and Turkey, to advise the Governments on the application of nuclear techniques to their water problems. Scientists from the Agency's Secretariat made studies on the western border of the Lake Chad basin in Niger; these studies brought out useful new information about the origin of water movement into Lake Chad and particularly the role played by local recharge and blending of local water of recent origin with much older water which moves slowly from the north-west towards the lake. Continued application of this technique could help to draw up a full picture of the origin of the waters of the lake, the rate of movement into it from various sources and other information of potential value for its economic use.

55. The Council has previously been informed of the work done in the Antalya region in Turkey. [12] This study of the relationships between various lakes and springs has been broadened to include a study of groundwater in the Konya Plain irrigation development.

56. Other groundwater studies are under way as part of UNDP/Special Fund projects in Jamaica, Jordan and Spain. These techniques are also being employed by Headquarters staff in studies of the groundwater system of the Vienna basin.

57. In the Agency's programme of stimulating exchange of information, a symposium on the further use of isotopes in hydrology was held in November 1966 in conjunction with the International Union of Geodesy and Geophysics. It attracted wide interest and provided a useful forum for reviewing the latest developments in isotope techniques and bringing them to the notice of practising hydrologists.

58. The Council is informed by UNESCO of the progress being made in IHD. The Agency is contributing in the following ways:

(i) By helping to collect basic data on tritium and stable isotopes in the major rivers of the world and thus contributing to fundamental studies of river basins;

(ii) By making studies of the "water balance" and inventories of water in the Vienna basin and in the Modry Dul basin in the Czechoslovak Socialist Republic. The latter study is expected to give information of fundamental importance in investigating the hydrological features of mountain basins where part or much of the water derives from snow;

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[12] Agency document INFCIRC/80 - (United Nations document E/4183) - para. 31.

(iii) By servicing the IHD working group on nuclear techniques in the "saturated and unsaturated" zones, i.e. below and above the water table, respectively; and

(iv) By supplying lecturers at UNESCO training courses on hydrology at Prague and Delft and at the ECAFE/UNESCO course on the methods and techniques of groundwater investigation and development (Teheran, October 1966).

2. Use of nuclear energy for water desalination

Recent world developments

59. One of the main developments since ECOSOC was last informed of progress in this technology has been the decision to build a large dual-purpose desalting and electric power station in southern California, United States. The Agency has pointed out to the Advisory Committee on Science and Technology that the chief need today is to gain direct practical experience in building and operating nuclear desalting plants - only in this way will it be possible to obtain facts about the capital costs of such plants, the actual costs of desalted water and the problems of operating large-scale desalting equipment in conjunction with a nuclear reactor.

60. The southern California plant and the Soviet fast-breeder dual-purpose plant on the Caspian Sea - the construction of which has already been reported to the Council - will thus offer indispensable information for assessing the future potential of nuclear desalting.

61. The southern California project will comprise a desalting plant having an output of 190 000 cubic metres of fresh water a day (m^3/day) and a power station producing 1600 MW(e) net. Ultimately it is expected that the capacity of the desalting plant will be increased to a total of 570 000 m^3/day.

62. The main building of the Caspian Sea plant is nearly completed and the major equipment is being manufactured. The 1000 MW(th) fast breeder will provide 150 MW of electricity and 120 000 m^3/day of desalted water.

63. Other developments have included the following:

(i) The engineering feasibility study of a dual-purpose plant for Israel producing 200 MW(e) and 380 000 m^3/day of desalted water has been completed. At the present time the main concern is to obtain finance at a sufficiently low rate of interest so that the project will be economically feasible and attractive;

(ii) The United Arab Republic is studying the problems of financing a nuclear desalting project of 150 MW(e) and 20 000 m^3/day of desalted water at Borg El-Arab. Tenders have been submitted by a number of potential suppliers;

(iii) Tunisia, which is interested in desalting activities, has already studied the feasibility of building a dual-purpose nuclear desalting plant in the southern part of the country; and

(iv) The United Kingdom, where extensive experience has been gained in building and operating conventional desalting plants, and France have also carried out design studies for nuclear desalting plants.

Agency activities (including work in co-operation with other organizations)

64. Although nuclear desalting technology is at a stage that may be comparable with that of nuclear power a decade or so ago, the promise that it offers has aroused great interest in developing countries, and it is most desirable that there should be means for a

continuing exchange of information on the latest developments and a source of authoritative advice to Governments interested in exploiting this technology. The Agency is providing the former chiefly by means of panels in which experts from interested countries - developing and advanced - meet once or twice a year to review the state of the art.

65. Since it may be economically advantageous to combine the production of electric power and water in the same dual-purpose plant, the Agency has been giving special attention to this matter and convened a panel on the subject in November 1966. The panel studied especially the reactors that are suitable for single- or dual-purpose desalting applications, and the means of varying the ratio of production of water to production of power so as to satisfy different local conditions and needs.

66. Advice and assistance to Member States is provided by missions such as those sent during the year to Chile and Peru in which experts from the United Nations Secretariat took part.

67. To enable the Agency's Secretariat to provide the authoritative advice needed by Member States it must itself keep in close touch with developments. It has been able to do so by taking some part in the Israeli and United Arab Republic studies referred to above, and the joint Agency/Mexico/United States study described below, by participating in a new study which is being carried out jointly by Greece and the United States on various possibilities for supplying water and power to the Athens area (including a dual-purpose nuclear plant), and by receiving reports and documents exchanged between the Soviet Union and the United States under the relevant agreement between those two countries. These reports are available for loan to Member States.

68. A project of particular interest to the Agency is the joint Agency/Mexico/United States study of the technical and economic practicability of constructing a dual-purpose plant to supply water and electricity to the border states in both countries near the head of the Gulf of California [13]. The study is detailed and far-reaching and includes surveys of hydrological and soil conditions, seismological and geological surveys of possible plant sites, arrangements for the best use of reactors and water plants, problems of transporting and distributing the water produced, and of using the power produced. It will provide the Secretariat with valuable experience for helping with similar detailed studies in other parts of the world.

[13] Baja California and Sonora in Mexico, and Arizona and California in the United States.

V. OTHER AGENCY PROGRAMMES

69. In addition to the three major programmes reported upon above, a brief reference to some of the Agency's other activities may be of interest.

70. The advent of commercial nuclear power also affects the Agency's work in health, safety and waste management. Having established standards on the main questions of radiation protection, the Agency is turning more to the problems of reactor siting and of finding safe and cheap means of disposing of nuclear waste. It plans to expand the help it gives in solving the local health and safety problems of Member States, and to provide services that will facilitate the international transport of nuclear fuel and other radioactive materials. It has for some time been holding regional study groups, and is expanding its advisory services and other field activities.

71. Member States are tending to assign larger responsibilities to the Agency for handling nuclear science information. In its own work the Agency has been introducing computer methods and the advanced techniques which go with them. The Secretariat is studying plans for setting up a large international nuclear information service which would include a clearing-house operation.

72. One of the most important applications of isotopes is in medicine, particularly in the developing countries. The growing interest in this specialization is shown by the rapidly increasing number of new centres for nuclear medicine which are now being built or planned.

73. In the industrial uses of isotopes and radiation the Agency's programme is moving from general surveys to field work, and especially to training. An effort is being made to promote co-operation between atomic energy commissions and industry in various developing countries.

VI. TECHNICAL ASSISTANCE ACTIVITIES

74. The Agency's technical co-operation programmes depend on the voluntary contributions of Member States to the Agency's General Fund, United Nations resources [14], and contributions in kind and donations of equipment made by Member States. The voluntary contributions to the General Fund for 1966 and 1967 are listed in the Annex. Details of funds budgeted and available for technical assistance from the General Fund and UNDP/TA resources are set out in the two tables below.

Funds for technical assistance under the Agency's regular programme

Item	1962 $	1963 $	1964 $	1965 $	1966 $
Target set for voluntary contributions to the General Fund	2 000 000	2 000 000	2 000 000	2 000 000	2 000 000
Amount pledged	1 380 470	1 437 394	1 374 447	1 330 589	1 286 297
Amount budgeted for technical assistance	1 625 000	1 799 000	1 680 000	1 749 000	1 777 000
Funds available for technical assistance	1 146 294	1 230 176	1 114 711	1 199 526	1 214 820

Funds for technical assistance from UNDP/TA resources

Biennial period	Amount $
1961/62	1 630 000
1963/64	2 099 000
1965/66	2 072 000
1967/68	2 540 000

75. During the past year the number of fellowship nominations decreased by approximately 10% as compared with 1965; the number of awards, however, went up, and requests to the Agency for all other types of technical assistance were somewhat higher than for 1965. Although the total monetary resources available to the Agency (including UNDP funds) for technical assistance increased from $1 989 000 in 1962 to approximately $2 560 000 in 1966, it will be noted from the first table above that the gap between the amount budgeted and the actual funds available for technical assistance under the Agency's regular programme continues to be significant.

76. Voluntary contributions to the General Fund have not only consistently fallen short of the yearly target, but, as project and training costs continue to rise, their real value has in fact dropped beneath that of, for example, the 1962 programme. Moreover, even if the real value of available monetary resources were to remain fairly constant, the increasing number of requesting countries and the growth of their essential needs would inevitably result in a gradual reduction of the extent to which their technical assistance requests can be satisfied.

[14] That part of UNDP formerly known as EPTA.

It is hoped that the increase in UNDP resources for the 1967/68 biennium will be accompanied by a similar or even higher growth rate in the voluntary contributions of Member States to the Agency's General Fund.

77. During 1966 the Agency awarded 501 fellowships from gifts in kind provided by Member States and from its monetary resources; financed the assignments of 201 experts and visiting professors who served as advisers and lecturers in Member States; held 12 international or regional training courses; and, for the first time, conducted a study tour for scientists. This was on the industrial applications of radioisotopes and included visits to numerous installations in the Czechoslovak Socialist Republic, France, the United Kingdom and the Soviet Union.

78. In addition, the Agency acted as Executing Agency for the following four Special Fund projects, the first two of which were completed in the course of the year:

UNDP/Special Fund Projects for which the Agency is Executing Agency

Country or region	Title of project	Project duration (years)	Plan of operation signed (date)	Special Fund Governing Council earmarkings $
Yugoslavia	Nuclear research and training in agriculture	3 3/4	8 Apr. 1963	646 600
Philippines	Pre-investment study on power, including nuclear power, in Luzon	2 1/4	14 Feb. 1964	398 400
Central America	Eradication of the Mediterranean fruit fly	3	29 Jul. 1965	870 200
Turkey	Pilot project for radiation disinfestation of stored grain	3	4 Nov. 1966	703 000

ANNEX

VOLUNTARY CONTRIBUTIONS BY MEMBER STATES TO THE AGENCY'S GENERAL FUND FOR 1966 AND 1967

Member	Contribution pledged (equivalent in United States dollars at UNDP rates)		Paid $	Paid $
	1966	1967	1966	1967
Argentina	16 600	16 600	-	-
Australia	20 000	20 000	20 000	-
Austria	9 600	9 600	9 600	-
Belgium	10 000	-	10 000	-
Bolivia	800	800	-	-
Brazil	17 200	17 200	-	-
Bulgaria	-	2 500	-	-
Burma	1 000	1 000	1 000	-
Canada	57 200	57 000	57 200	-
Ceylon	2 100	2 100	2 100	-
Chile	-	5 000	-	5 000
China	5 000	5 000	5 000	-
Colombia	1 000	1 500	-	-
Congo, Democratic Republic of	1 000	1 000	-	-
Cyprus	280	-	280	-
Czechoslovak Socialist Republic	-	13 889	-	-
Denmark	11 200	11 200	11 200	11 200
Ecuador	-	1 000	-	-
El Salvador	800	-	800	-
Finland	7 800	7 800	7 800	7 800
France	30 612	-	30 612	-
Germany, Federal Republic of	120 000	133 400	120 000	66 700
Ghana	1 400	1 400	-	-
Greece	4 600	4 600	-	-
Guatemala	1 000	800	1 000	-
Holy See	2 000	2 000	2 000	2 000
Hungary	-	4 259	-	4 259
Iceland	800	800	800	800
India	35 000	35 000	35 000	-
Indonesia	2 000	2 000	2 000	-
Iran	2 000	-	2 000	-
Iraq	1 400	1 400	1 400	-
Israel	3 000	3 000	3 000	-
Italy	45 800	45 800	45 800	-
Ivory Coast	800	-	800	-
Japan	50 000	49 800	50 000	-
Korea, Republic of	2 400	2 400	2 400	-
Kuwait	1 000	-	1 000	-
Lebanon	1 000	-	1 000	-
Liberia	6 301	-	6 301	-

Member	Contribution pledged (equivalent in United States dollars at UNDP rates)		Paid $	Paid $
	1966	1967	1966	1967
Madagascar	800	800	800	800
Mexico	14 600	14 600	-	-
Monaco	2 000	2 000	2 000	-
Morocco	2 000	-	2 000	-
Netherlands	18 600	20 000	18 600	-
New Zealand	5 000	5 000	5 000	-
Nigeria	3 080	-	3 080	-
Norway	8 000	8 000	8 000	8 000
Pakistan	6 000	6 000	6 000	-
Philippines	6 200	6 200	6 200	-
Poland	-	4 167	-	-
Portugal	3 600	3 600	3 600	-
Saudi Arabia	1 200	1 200	1 200	1 200
South Africa	9 400	9 400	9 400	-
Spain	10 000	10 000	10 000	-
Sweden	23 000	22 600	23 000	-
Switzerland	15 800	15 800	15 800	15 800
Thailand	3 000	3 000	3 000	-
Tunisia	1 905	-	1 905	-
Turkey	6 400	6 200	6 400	-
Union of Soviet Socialist Republics	-	111 111	-	-
United Arab Republic	11 500	11 500	11 500	-
United Kingdom of Great Britain and Northern Ireland	130 200	110 000	130 200	-
Uruguay	-	2 000	-	-
Venezuela	9 000	9 000	-	-
Viet-Nam	1 400	1 400	1 400	-
Yugoslavia	6 400	6 400	6 400	-
	771 778	849 826	705 578	123 559
United States of America (including matching contribution)	514 519[a/]	509 896[b/]	-	-
Total	1 286 297	1 359 722	705 578	123 559

a/ Equivalent to 40% of the total pledged by all Member States including the United States.

b/ Equivalent to 37.5% of the total pledged by all Member States including the United States.